NICE³
Project Fact Sheet

SO_3 Cleaning Process in Semiconductor Manufacturing

Cleaning semiconductors with sulfur trioxide gas removes photoresist with less hazardous chemicals

Benefits

- Significant energy savings compared to "dry" stripping with high-energy oxygen-ion plasmas are expected
- Reduced radiation and charging damage and reduced damaged product waste
- Improved product quality
- Reduced hazardous chemical use compared to "wet" stripping with acid solutions or organic solvents
- More efficient removal of photoresist at less cost

Applications

This technology is applicable to the semiconductor industry that produces semiconducting wafers for computers and other electronic equipment.

Project Partners

NICE³ Program
Washington, DC

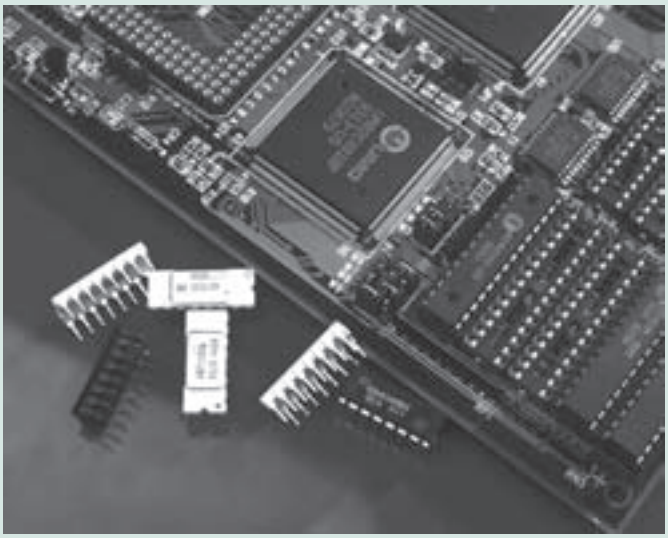
California Energy Commission
Sacramento, CA

Anon, Inc.
San Jose, CA

Removing photoresist, a light-sensitive material used in the manufacture of semiconductors, is fast becoming a major concern for United States manufacturers of semiconductors bound for computers and other electronic equipment. The hardened photoresist must be thoroughly cleaned from very small crevices on the semiconductor wafer at various stages in the manufacturing process.

A new sulfur trioxide ($S0_3$) gas-phase cleaning process developed by Anon, Inc., removes residual photoresist and organic polymers through a simple, two-step exposure to $S0_3$ followed by a deionized water rinse. Anon's technology is technically and economically superior to existing semiconductor cleaning methods. By eliminating the use of damaging high-energy plasmas used in dry, semiconductor cleaning methods, the Anon process improves semiconductor yield and reliability. By eliminating costly wet chemical cleans, the Anon process eliminates the use of large volumes of hazardous or toxic chemicals. These improvements in the effectiveness and efficiency of photoresist cleaning translate into major improvements in manufacturing capability and dramatic reductions in cleaning costs for manufacturers of semiconductors.

Semiconductor Wafer Production



Photoresist, a light-sensitive material, is used to produce semiconductor wafers for computers. Removing hardened photoresist can now be achieved without damage and with reduced use of hazardous chemicals by exposing the wafers to a gas process developed by Anon, Inc.

Project Description

Goal: The goal of this project is to demonstrate that photoresist can be effectively cleaned from semiconductor wafers in processing by exposing them to a $S0_3$ gas, followed by a rinsing in deionized water. This process is anticipated to substantially replace damaging dry stripping and hazardous-waste-producing wet stripping in the semiconductor manufacturing industry.

Progress and Milestones

- The process is being tested on substrates from several major semiconductor and flat-panel display manufacturers, with impressive results.
- A computer-controlled photoresist stripping tool was built to implement the process. It was demonstrated successfully on a variety of semiconductor cleaning applications.
- Anon has built a small clean room on-site to simulate clean conditions for demonstrating the process.

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An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry.
This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to $525,000. Grants fund up to 50% of total project cost for up to 3 years.

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